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Polymer dynamics and ion conduction in modified soluble starch¹ HYUNGKI LEE, JAMES RUNT, Penn State University — The dynamics of neat and plasticized carboxylated starch is investigated using broadband dielectric relaxation spectroscopy (DRS). The sodium single ion conductor is prepared by a 2,2,6,6tetramethylpiperidin-1-oxyl (TEMPO) mediated oxidation process, in which the primary hydroxyl groups in alpha-D-glucose units are replaced by carboxylic salts. DRS measurements show that the ionic conductivity increases with increasing degree of oxidation. For example, 78 percent carboxylated starch with 25 weight percent glycerol displays around 3 orders of magnitude higher ionic conductivity than the comparable glycerol- plasticized 25 percent carboxylated material, principally due to the higher content of mobile cations. The role of salts and plasticizers including water on the relaxation behavior of amylose-rich starch is explored. Other complimentary techniques are used in the investigation, including FTIR, XRD and DSC.

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HyungKi Lee

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